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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/505,254	04/06/2005	Hartmut Reich-Sprenger	930008-2189	6016

7590 05/13/2009

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EXAMINER	
HORNING, JOEL G	

ART UNIT	PAPER NUMBER
1792	

MAIL DATE	DELIVERY MODE
05/13/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/505,254	REICH-SPRENGER, HARTMUT	
	Examiner	**Art Unit**	
	JOEL G. HORNING	1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 December 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-34* is/are pending in the application.

4a) Of the above claim(s) *1-25* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *26-34* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *08-20-2004*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Claims 1-25 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected inventions, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on December 29th, 2008, since no arguments were presented as to why the restriction was improper.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. Claims 26, 28, 29 and 32-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Benvenuti (US 6468043) in view of Welty (US 5269898) in view of Snaper (US 3625848).

Independent **claim 26** is directed towards a method for depositing a non-vaporising getter metal alloy coating on the inner wall of a high-vacuum vessel to be

coated. The getter metal alloy contains at least one getter metal with a melting point above 1500^0C and a vaporization temperature above 3000^0C. The deposition process comprises:

a. Igniting a light arc between a cathode wire comprised of a getter metal alloy and an anode member by means of a high-voltage ignition pulse

b. Continuing the conversion of the cathode wire into a getter metal alloy plasma while maintaining a metal plasma light arc between the cathode wire and a cage shaped anode member spatially surrounding the cathode wire

c. Plasma coating, under a high vacuum , of the inner wall of the high vacuum vessel to be coated

d. Gas-tight closure of the coated ultra-high-vacuum vessel after coating.

Benvenuti teaches a method for depositing non-vaporizing getter metal alloy coatings onto the walls of high-vacuum chambers through a cathodic sputtering process. Benvenuti specifically teaches depositing these alloys on the inside walls of high-vacuum chamber components by a cathodic sputtering process. After the films are deposited onto the walls, the chamber is brought back up to atmospheric pressure and then assembled into a desirable high-vacuum device (col 4, lines 23-51), such as ion guidance tubes in particle accelerators (**claim 34**, col 18-21). Benvenuti teaches that the gettering effect of these coatings allow for “unrivaled” high vacuums, down to 10^{-10} or 10^{-14} torr (col 5, lines 9-12). Benvenuti teaches getter metal alloys comprising zirconium, which, as stated above in the restriction, have a melting point above 1500^oC

and a vaporization temperature above 3000°C, as being suitable (col 3, lines 61-62). However, Benvenuti does not teach using a cathodic arc to deposit the films.

Welty also teaches a method for depositing a metal alloy coating onto a substrate (col 1, lines 15-21), which can be the inner wall of a vacuum chamber (col 8, lines 28-35). However, Welty teaches doing so by a cathodic arc deposition process. In the process, an electrical arc (which would emit light, making it a “light arc”) is ignited by means of a high voltage spark (col 1, line 44) between a cathode wire and an anode (col 5, lines 63-68). The anode can be cage-shaped (the helical wire surrounding the cathode can be the anode) (col 6, lines 2-3 and 21-28). As the arc discharges between the anode and cathode, the material of the cathode is vaporized into a metal plasma arc, which then coats the inner wall of the vacuum chamber (col 1, lines 33-55).

Snaper teaches that cathodic sputtering methods and cathodic arc methods are both suitable for depositing metal films, however, cathodic sputtering processes have slow deposition rates compared to cathodic arc deposition processes, which may be an order of magnitude faster (col 3, lines 13-26).

Thus it would have been obvious to a person of ordinary skill in the art at the time of invention to modify the Benvenuti’s process of creating ultrahigh vacuum systems with gettering coatings by using Welty’s cathodic arc deposition process for depositing alloys on inside chamber walls instead of the cathodic sputtering process in taught be Benvenuti. Such a person would have been motivated to do so in order to deposit the films an order of magnitude faster, allowing for more throughput in the process.

4. **Regarding claim 28**, Welty's cathodic arc system teaches using a grounded anode (figure 2b), it also teaches that the typical voltage of each arc is between 15V and 50V (col 1, lines 30-32) and that there may be multiple arcs present (col 1, lines 45-46). Since the anode is grounded, it is a parallel circuit and a process where there are two arcs would typically require a cathode potential between -30V and -100V, when there are three arcs, the cathode potential would typically be between -45V and -150V, etc. Thus it would have been obvious to a person of ordinary skill in the art at the time of invention to use a cathode potential between -100V and -300V depending upon the potential of each arc and the number of arcs simultaneously present.

5. **Regarding claims 29 and 33,** as discussed above, Welty's cathodic arc system has a head that generates metal plasma to deposit films on the inside walls of a high vacuum vessel. The device includes a cathode (1), which has an insulator member (12), an ignition electrode (e.g. 11), a surrounding anode member (4), and can be moved linearly within the high vacuum vessel during deposition in order to improve uniformity and coat large substrates (col 8, lines 36-42).

The examiner takes official notice that high vacuum slide through ports are notoriously well known to the art of vacuum science for moving components linearly in vacuum chambers (for example the sample loading rods in many scanning electron microscopes) and it would be obvious to use one to produce the linear motion taught by Welty.

Benvenuti teaches can that in order to create alloy coatings of non-vaporizable gettering metals, the cathode can be a bundle of wires of the different components,

which allows the formation of alloys that are thermodynamically unstable and will not form other ways (col 5, lines 1-8). Thus it would have been obvious to a person of ordinary skill in the art at the time of invention to use a bundle of wires as the cathode in order to be able to create alloys that are thermodynamically unstable.

It is obvious that when coating large substrates that cannot be entirely coated with the stationary head, that for a given flux, the rate at which that linear motion takes place will control how long any part of the chamber is exposed to the flux and the resulting thickness of the coating at that point.

6. **Regarding claim 32** the thickness of the coating is limited by the amount of material available to form that coating. When that material is exhausted the coating will stop thickening. In the Benvenuti in view of Welty in view of Snaper process, the cathode is the material available to form the coating. The thicker it is, the more material is available to form a coating and the coating itself can be thicker. In this way the cathode thickness controls the thickness of the coating.

7. **Claim 27** is rejected under 35 U.S.C. 103(a) as being unpatentable over Benvenuti in view of Welty in view of Snaper as applied to claim 26 above, and further in view of Naidu et al (High Voltage Engineering (2nd Edition). (pp. 1-3). McGraw-Hill).

Claim 27 further requires that the arc be ignited by a high voltage ignition pulse in the range of -18kV to -30kV by an ignition electrode on an insulator member by means of an ignition pulse supply. Benvenuti in view of Welty in view of Snaper teaches the use of a high voltage spark, which must originate from somewhere (an ignition electrode), since a spark is produced, the electrode must be on a dielectric gap for the

plasma to cross (an insulator, like the gas in the chamber) which necessarily must be applied by a high voltage supply (whatever supplies the high voltage spark) (Welty, col 1, line 44). Benvenuti in view of Welty in view of Snaper does specifically teach the voltage used to obtain the spark.

However, Naidu et al teach that the voltage required to create a spark between two electrodes depends upon several factors, including the identity of the gas, the gas pressure and the gap distance that the spark must bridge (section 1.2). What these factors are will determine the proper range for the ignition voltage.

Thus, it would have been obvious to one of ordinary skill in the art at the time of invention to choose the instantly claimed ranges of an ignition pulse from -18kV to -30kV through process optimization when these other factors require it, since it has been held that when the general conditions of a claim are disclosed in the prior art (i.e. a high voltage spark), discovering the optimum or workable ranges involves only routine skill in the art. See In re Boesch, 205 USPQ 215 (CCPA 1980).

8. **Claim 30** is rejected under 35 U.S.C. 103(a) as being unpatentable over Benvenuti in view of Welty in view of Snaper as applied to claim 26 above, and further in view of Johnson (US 5688416).

Benvenuti in view of Welty in view of Snaper teach As discussed above in the claim 26 rejection, the anode can be a helical wire surrounding the cathode, producing a magnetic field (Welty: col 6, lines 2-3 and 21-28) which can be used to control the motion of the arc. Specifically, the magnetic field influence causes the arc spot to start

at one end of the cathode (at the striker) and move down the length of the cathode rod until it reaches the other end, where an insulator stops it (Welty: col 6, lines 14-20). They do not teach a wire wound onto an insulating rod as the cathode. Rather, the cathode is itself shaped like a rod (Welty: col 5, lines 63-64).

However, Johnson teaches that the plasma arc stability is dependent upon the geometry of the wires. Filament geometries without windings (i.e. rod shaped) produce plasmas that are much more unstable than they would be if the filament was wound into a helical form where the magnetic field produced could be designed to reduce the instabilities (col 6, lines 14-28). As a result, Johnson teaches forming the interior and the exterior filaments into helix shapes. The internal filament is wound into the grooves of an insulating mandrel (col 2, lines 47-48), where it can provide circumferential and axial support to the plasma arc so that defects, like arc kinking and collapse, can be eliminated (col 4, lines 24-28). The outer filament is also a coil and produce an axially oriented magnetic field (col 4, lines 27-30). The overall magnitude of the magnetic field is determined by the combination of the electromagnetic fields produced by both filaments, allowing them to be designed in such a way to stabilize the plasma arc (col 4, lines 30-36). The double helix geometry is shown in figure 1.

As a result, it would have been obvious to a person of ordinary skill in the art at the time of invention to modify the shape of the cathode from a rod to a helix wrapped around an insulating mandrel. Such a person would have been motivated to use the helix geometry in order to increase the arc stability and their control over its motion and

to wind the internal wire around an insulating mandrel in order to avoid arc defects, like arc collapse.

9. **Claim 31** is rejected under 35 U.S.C. 103(a) as being unpatentable over Benvenuti in view of Welty in view of Snaper as applied to claim 26 above, and further in view of Beers et al (US 5932078).

Benvenuti in view of Welty in view of Snaper teach depositing the coating under a high vacuum (Welty col 1, lines 27-28) but do not specifically teach rotating the plasma generator during deposition by means of a high-vacuum rotary port.

However, Beers et al teach a cathodic arc deposition method in which they teach that performing relative rotation of the substrates to the cathode promotes uniform deposition of the coating on the substrates (col 5, line 65 to col 6, line 1), the rotation is performed in a vacuum vessel (col3, lines 38-39) by rotating a shaft that is extended through the vacuum vessel (col 4, lines 12-13).

Thus it would have been obvious to a person of ordinary skill in the art at the time of invention to use a high-vacuum rotary port (since it is under high vacuum it would need to be a high vacuum rotary port) to produce a relative rotation between the substrate/chamber and the plasma generator/cathode in the three ways that are possible (depending upon the point of reference): by rotating the substrates, by rotating the plasma generator, or by rotating both. Such a person would have been motivated to do so in order to improve the uniformity of the resulting films.

Response to Arguments

10. Applicant's arguments filed December 29th, 2008 have been fully considered but they are not persuasive.

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Regarding applicant's argument that no combination of the references teaches the specific claimed feature ***"…continuing conversion of the cathode wire into a getter metal alloy plasma while maintaining a metal plasma light arc between the cathode wire and a cage-shaped anode member spatially surrounding the cathode wire":***

As discussed in the rejection above, Benvenuti teaches the desirability of depositing a getter metal alloy film, but uses cathodic sputtering intstead of a cathodic arc.

Welty teaches using a cathodic arc process to deposit metal films which converts a cathode wire into a metal plasma while maintaining a metal plasma light arc between the cathode wire and a cage-shaped anode member spatially surrounding the cathode wire. As cited above, the helical wire surrounding the cathode (which applicant only identifies as the "helical electromagnetic coil") can be the *sole anode* for the cathodic arc discharge (col 6, lines 2-3 and 21-28), which means that the arc would be between the cathode and this cage shaped anode which spatially surrounds the cathode.

Snaper et al motivates replacing the cathodic sputtering process of Benvenuti et al with the cathodic arc process of Welty et al by teaching that cathodic arc discharges allow deposition to occur an order of magnitude faster than cathodic sputtering discharges.

Thus the combination of the teaching of the references demonstrates that it would have been obvious to a person of ordinary skill in the art at the time of invention performing the getter metal alloy deposition process of Benvenuti et al to replace the taught cathodic sputtering process with the cathodic arc process of Welty in order to deposit the films an order of magnitude faster.

Conclusion

11. No current claims are allowed.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOEL G. HORNING whose telephone number is (571) 270-5357. The examiner can normally be reached on M-F 9-5pm with alternating Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael B. Cleveland can be reached on (571)272-1418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J. G. H./
Examiner, Art Unit 1792

/Michael Cleveland/
Supervisory Patent Examiner, Art Unit 1792